OCEANIC RESPONSES TO SEASONAL CHANGES OF ASIAN MONSOONS

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The South China Sea (SCS) is a semi-enclosed ocean basin whose circulation is largely driven by the seasonal change of wind. We know relatively little beyond that because of the lack of observations. In this study, the seasonal changes of the monsoons and their oceanic responses in SCS are compared with those in the Bay of Bengal (BB) and the Arabian Sea (AS), using a combination of spacebased observations.

The onset of winter monsoon is clear in the SCS, with sharp increase in wind speed in September, and with steady wind direction from the Northeast. The winter monsoon is much weaker in the BB and AS. In AS and BB, the onset of summer monsoon is marked by sharp increase in wind speed, while the summer monsoon in SCS is relatively weak, with large fluctuation in wind direction due to intraseasonal activities. Water vapor increases sharply in May in SCS and in June in AS and BB, signifying the onset of summer monsoon. In both AS and SCS, SST rises steady from March to May with no abrupt jump. It decreases slightly after the onset of summer monsoon.

Strong negative correlation between the curl of wind stress and sea level changes, and between the curl of wind stress and sea surface temperature, with the stress curl leading by a month, are found in the deep part of SCS. The negative correlation agree with a simple Ekman pumping scenario. Cyclonic wind causes an upwelling in the ocean; lower sea level and cooler temperature result from the rise of the thermocline. The opposite is true for anticyclonic wind. Such strong negative correlation is not found in the BB or AS, largely because these two ocean basins are more open to advection from outside. Another possible reason is that the seasonal contrast in oceanic response to wind forcing is much larger in SCS. Ocean circulation, as the sum of geostrophic and Ekman currents estimated from spacebased estimation of wind stress and sea level change, agree better with in situ measurements in the SCS than in other two ocean basins.